Lateral injection of oxygen with the Bosporus plume‐fingers of oxidizing potential in the Black Sea

Konovalov, Sergey K., George W. Luther, III, Gernot E. Friederich, Donald B. Nuzzio, Bradley M. Tebo, James W. Murray, Temel Oguz, Brian Glazer, Robert E. Trouwborst, Brian Clement, Karen J. Murray, Alexander S. Romanov

Limnol. Oceanogr., 48(6), 2003, 2369-2376 | DOI: 10.4319/lo.2003.48.6.2369

ABSTRACT: Saline and warm Mediterranean water flowing through the Bosporus Strait maintains a permanent pycnocline with vertical separation of oxic (O_2), suboxic (absence of O_2 and H_2S), and anoxic (H_2S) zones in the Black Sea. The stable suboxic zone implies restricted vertical mixing of the upper oxic and lower anoxic layers and limited vertical flux of oxygen that cannot balance the upward flux of sulfide. We report data that directly confirm massive lateral injections (>200 km from the Bosporus) of oxygen-enriched waters of the Bosporus plume, created by the mixing of shallow, cold, intermediate-layer Black Sea water with Mediterranean water. These plume waters are laterally injected into the oxic layer and, more importantly, into the suboxic and anoxic layers over several small vertical scales ("fingers" of ~5 m) at water densities (σ_t) from 15.0 to 16.4. O_2 injection oxidizes Mn(II) to Mn(III,IV), which then oxidizes H_2S. The onset of H_2S detection occurs in deeper waters in the southwest (>170 m; σ_t ~= 16.4) relative to the west central Black Sea (110 m; σ_t ~= 16.2) and coincides with increased MnO_2 and S_8 formation in the southwest.

Article Links

Download Full-text PDF

Return to Table of Contents

Please Note

Articles in L&O appear in PDF format. Open access articles may be freely downloaded by anyone. Other articles are available for download to subscribers only, or may be purchased for $10 per article. All L&O articles are moved into Open Access after three years.